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ANTHROPOLOGY.<sup>1</sup>

**Mr. Keane on Paleolithic Man.**—Mr. A. H. Keane in his recent publication "Ethnology" takes serious exception to my denial of there having been a paleolithic period, and says "Paleolithic necessarily antedates Neolithic Culture." In what does this necessity consist? Why should Paleolithic precede Neolithic Culture? The names it is true signify old and new, but are at best arbitrary, being a suggestion of Sir John Lubbock to distinguish a supposed "chipped" from a "polished" stone period. Mr. Keane says "where there is a time sequence, the chipped stones being of ruder and simpler formation, naturally precede the more perfected polished objects." The proof of a "time sequence" is by no means a settled question, this assertion being negatived in one way or another by every writer on Archeology. The chipped stones are not "ruder" than polished stones, nor are they "simpler" in shape, material or facility with which the shape may be given. I have only attempted to discuss the subject from a technical standpoint and from the writings on the subject generally, from either of these points, however, or from both together I contend my position is sustained. Chipping stone is a more difficult mechanical process than grinding and pecking stone, it is more complicated in its minutiae, involving, it is true, blows with a hammer, the difference being that the chipper's blow is of necessity more deliberate, slower and of necessity more accurate than the blow given in pecking. A doubt of the accuracy of this proposition may be solved by taking a flint and a diorite and attempting with any hammer to shape them. If ordinarily careful the diorite will be worn into shape, while on the other hand the chances are many to one that the flint is destroyed before completion.

Mr. Keane objects that "European archeologists are asked to reconsider their own conclusions." Undue weight being shown to have been given certain evidence, European archeologists owe it to themselves to reconsider their conclusions. Up to a recent period it was believed generally that to shape a Neolith or ground implement was more difficult than it was to shape a Paleolith or chipped implement, and such difficulty was used as the main evidence upon which to support the theory of a chipped preceding a polished stone age. Having been shown that the contrary was the case, one would presume

<sup>1</sup> This department is edited by H. C. Mercer, University of Pennsylvania.

European archeologists would seek to examine their error without being forced to do so. Mr. Keane says "There is necessarily a time sequence wherever the two cultures have been developed." The mistake the author falls into is in declaring that to chip a stone or to grind and peck a stone constitute two cultures, for experiment proves the contrary; try to chip a diorite and you only shape it by powdering the surface, for it does not chip, try to batter a flint and it breaks through the ordinary lines of cleavage and is destroyed, for it does not peck.

Again the author of *Ethnology* says "that until it is shown that fire arms are as old as paleoliths, no European archeologist will ever believe that polished implements are as old as the chipped stones." Though this will hardly pass as scientific argument we would say, here again Mr. Keane is in error, for instances of chipped and polished stones being found in the same layer with fossil bones has been recorded on too many occasions to leave room for doubt to one who would decide on written authority alone. Up to this time Mr. Keane has argued in favor of the simpler process preceding the complex, but here he says "it is a fallacy to suppose that the easier process comes first," and instances "transport by wheeled vehicles or by steam as immeasurably easier than pack animals." If we are to construe the word "easier" as being synonymous with "simpler" it opens a new field of argument to assert that the complex precedes the simple in machinery, or that the machine of many parts is the ancestor of the machine of few parts, this proposition will not meet with many supporters.

My views concerning the mechanical status of primitive peoples has been formed solely from experiment with primitive tools and reading the literature of archeology. The technology of archeology appears to be little understood in Europe, its importance being almost ignored, as is evidenced by the apparent inability to grasp the plainest mechanical propositions. The results of my experiments are sustained by my field discoveries as they are by research in the library, and considered from any of these positions the fact that an identical mechanical culture produced, chipped or polished stone appears to be indisputable. The earliest cave remains show man to have made the best use of material at his command. Where he had flint he chipped it; if on the contrary he lived in a region of metamorphic stone he would of necessity hammer it into shape; if horn and ivory were plentiful he would saw and grind it. If one will make experiments with primitive implements in reproducing primitive work they will not fail to appreciate the correctness of the views here expressed. As illustration take

material from Magdalen Cave, from Les Eyzies, from St. Acheul, from Moustier, from Chelles, even from Cissbury or from where one will, and try to make from it arrow heads of a different type from that usually found in the locality from which the material is brought and examine the result. One finds that flint chips within certain limits, for it depends even more on the material than on the workman as to the shapes the nodules work into. The difference in the tool with which the stone is worked is secondary to the texture of the stone. One of the best illustrations of this is in the obsidian spear heads from Easter Island. They are of a gritty texture, extremely rude, fully as rude as the rudest paleolith, and are chipped almost entirely from one side. Try to improve the shape of one of these implements and rude as they are, failure is the inevitable result; try to chip it from the wrong side and it breaks through and destroys the specimen, the best and most expert workman cannot improve its shape. Take, however, one of the obsidians from Mexico of even texture and to shape it in most graceful form is most easy, but with such material it would be almost impossible to imitate the rough arrow heads of Easter Island. The same stone varies enormously in its fracture in different layers, yet archeologists do not appear to have noticed the fact.

Only a few years since it was argued that paleolithic man was primitive man, man low in the scale of human development, to-day paleolithic man is apparently only primitive as a flint chipper, but an artist as a bone or ivory worker; the fact that technically considered the work necessary to shape a so-called "Baton of Command," itself probably a chipping tool, was identical with the chief work on the neolith (grinding) does not appear to be appreciated by those who believe in a paleolithic period. Five years ago or little more it was hotly denied that pottery belonged to the paleolithic period, and this was insisted upon until the accumulation of proof was so overwhelming that by many it was admitted, yet even now many deny that pottery is as ancient as many of the paleolithic cave strata.

J. D. MCGUIRE.

**Cave Exploration by the University of Pennsylvania in Tennessee.**—*Preliminary Report.*—To learn that the remains of Plistocene Man have been abundantly found in the caves of Europe; that equally significant remains of later savage, barbarous and civilized peoples have been similarly discovered in the caves of Europe, Asia and Africa; and that the remains of the Indian and the recent White Man have been found in caverns in North

America; warrants the supposition, that in the subterranean floor deposits of the new world, the problematic existence of Plistocene Man might be soonest and easiest demonstrated, while with hardly less ground we may urge as valuable testimony in the American region the absence of such remains in significant underground shelters. Not unreasonably such absence, occurring invariably at these immemorial halting places of men and animals, might indicate that Plistocene Man had never existed in the adjacent regions.

By this course of reasoning and investigation the University of Pennsylvania has sought to solve definitely the question first to attract and last to puzzle American students—How long has Man existed in the New World? Striving to limit the speculations of archæologists, the work has proceeded by degrees to reconcile with geology their study of pre-Columbian peoples, which, fascinating as it is, has lacked thus far subdivisions, landmarks and starting point, while an effort to eliminate, through the investigation of significant caves, one region after another from the field of search, has sought to narrow the area of possible discovery from the point of view explained. Having shown on the one hand that certain caverns like the fissure at Port Kennedy, (right bank of Schuylkill River, 3 miles below mouth of Perkiomen Creek, Montgomery County, Penna.,) containing in large quantity the remains of Plistocene animals without relics of Man, are geologically ancient, on the other hand, a fact of much significance has been demonstrated for the first time, namely, that a considerable number of other caves are modern, since their floors, well supplied with the refuse of Indians and later White Men, below which remains of geologically older peoples would not have been lacking in Europe, have failed to reveal any relic of Plistocene Man.

In these several instances the geologically modern remains (human) and the geologically ancient remains (animal) have lain apart in distinct caves, and hence less available for comparative study, but the recent expedition in Tennessee, resulting in the examination of three caves in which the old and new deposits lay in juxtaposition, has enabled us to push the question farther by studying the relation between the ancient and modern strata where, at their point of contact, it was most significant.

More broken and scattered even than at the remarkable tomb of extinct animals at Port Kennedy, were the remains of the Tapir, Pecary, Bear and smaller Mammalia at Zirkel's Cave, (left bank of Dumping Creek, about 5 miles above its mouth in French Broad.

River, Jefferson County, Tennessee,) visited by Professor Cope in 1869. Dislocated as before after the flesh had rotted, the bones were crushed by a force which had split them into fragments, and were deposited with a mass of clay mixed with lime, which filled the descending cave. Hardened finally into breccia not easily broken with the pickaxe, this bone bearing earth had disappeared at many points to make room for a deposit of cave earth containing the remains of the Rattlesnake, Woodchuck, Opossum, Rabbit and Cave Rat. It is the important relation of this latter modern earth, with its bits of mica and Indian pottery, to the older breccia that will constitute the material for a final report.

Previous examination, in 1893, at the Lookout Cave, (left bank of the Tennessee River, one-quarter of a mile below Chattanooga Creek, Hamilton County, Tennessee,) had revealed the bones of the Tapir and Mylodon in the lowermost zone of a floor deposit of Indian refuse, and upon the recent expedition the cave earth with its "culture layer" was entirely removed for 58 feet inward from the entrance to settle beyond doubt the relation of these fossils to the Indian remains resting upon them. At this significant spot, where again the Plistocene and recent deposits lay in contact, and where the specimens found were labeled according to their position, whether from the black (modern) earth above or the yellow (ancient) earth below, a completed examination should decide whether Man had or had not encountered the Tapir and Mylodon in the Valley of the Tennessee.

After a visit to "Indian Cave" on the Holston River, Carrol's Cave, and the Copperas and Bone Caves, near Tullahoma and Manchester, Tennessee, a new set of conditions was presented at Big Bone Cave (1 mile from the left bank of Caney Fork and about 2 miles above its mouth in Rocky River, Van Buren County, Tennessee.) There the bones of the Gigantic Fossil Sloth (*Megalonyx*), still retaining their cartilages, were exhumed from a dry deposit of the refuse of Porcupines and Cave Rats, mingled with fragments of reeds used as torches by Indians in a gallery 900 feet from the entrance, thus presenting us in the final summing up of this strange evidence a new notion of the relation of the modern Indian to this extinct animal, whose remains outnumber all its fossil contemporaries at Port Kennedy.

Thanks are due to Dr. William Pepper, to the Board of Managers and to Professor E. D. Cope for their kind co-operation in the expedition thus finished, which, at a cost of \$300, has presented the Museum with the specimens now under examination. These, if not attractive,

PLATE XI.



*Megalonyx jeffersonii* with articular cartilages at a. A, B, Vertebral epiphyses. C, Astragalus. D, Calcaneum.

are important. For Paleontology they mark in the bone breccia of Zirkel's Cave, a distinct stage in the Plistocene series, while for Anthropology they represent data which account for the presence of Man together with the bones of the extinct *Megalonyx*. They explain the relics of savages and the remains of Plistocene mammals at two caves situated in the Eastern Valley of Tennessee at a height of about 600 to 700 feet above the sea and within earlier reach of an overwhelming ocean in Champlain time, and again at a third cave, which, 300 feet higher on the continental floor and looking westward from the slopes of the Cumberland table-land, stands for that part of the Appalachian region whither animals and Man (if he existed) might have found convenient refuge when lower areas sunk, as is alleged, beneath the level of the invading waters.—HENRY C. MERCER.

Aldie, June 4, 1896.

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### SCIENTIFIC NEWS.

The proposed general synopsis of the Animal Kingdom (Das Thierreich) to be issued by the German Zoological Society, is one of the greatest undertakings ever planned in the line of bookmaking. It is proposed to give a short general account of each group, and following this is a synopsis of all existing forms, including those which have recently become extinct. The general editor of the whole series is Prof. Franz Eilhard Schulze of the University of Berlin, and he is assisted by the following department editors: Prof. O. Bütschli, Protozoa; Prof. C. Chun, Coelenterata; Prof. M. Braun, Plathelminthes; Prof. J. W. Spengel, Vermes; Dr. W. Kobelt, Mollusca; Dr. W. Giesbrecht, Crustacea; Prof. R. Latzel, Myriapoda; Prof. F. Dahl, Arachnida; Dr. H. Krauss, Orthoptera; Mr. A. Handlirsch, Neuroptera, Hemiptera; Dr. H. J. Kolbe, Coleoptera; Prof. C. W. Della Torre, Hymenoptera; Dr. A. Seitz, Lepidoptera; Prof. J. Mik, Diptera; Prof. F. Blochmann, Brachiopoda; Prof. E. Ehlers, Polyzoa; Prof. J. W. Spengel, Tunicata; Dr. G. Pfeffer, Fishes; Dr. O. Boettger, Batrachia and Reptila; Prof. A. Reichenow, Birds, and Prof. L. Döderlein, Mammals. These will be assisted by a host of collaborators for special groups, and the names of these, as far as announced, assures us of the